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Material Handling Equipment

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ABSTRACT

In ordered to propelled dead weight type automatic guided vehicle, we have treated rack pinion mechanism to conventional AGV in order to acquires self-propelled motion to materialhandling conventional AGV by utilizing rack and pinion motion transfer in this type of mechanism we have using rack and pinion type gear rack and pinion type gear are connected to platform, four springs are connected each corner of the platform so it will be acts power saving units. When dead weight is kept in the platform, platform moves downward direction so there exist gear train, it is subjected to lower portion (front or real axle of the vehicle). When gravitational force is applied on the platform and then platform is moves downward direction. When weight is removed from the platform, vehicle move backward direction without application of external force.

Keywords: Rack-Pinion;Spring; AGV; weight.

I. INTRODUCTION

Material handling equipment is equipment that relate to the movement, storage, control and protection of materials, goods and products throughout the process of manufacturing, distribution, consumption and disposal. Material handling equipment is the mechanical equipment involved in the complete system. Material handling equipment is generally separated into four main categories: storage and handling equipment, engineered systems, industrial trucks, and bulk material handling. Material handling is process of movement of job or material from one place to another place i.e. from one machine to another store room to machine shop or from machine shop to store. In many industries material handling is automated but it requires more electricity and it is main contribution of price of the product. Some small-scale industries material handling is manually material handling is risk full or harm full to workers or manpower.

II. LITERATURE REVIEW

Material handling equipment is the media of transportation of material from one location to another in a commercial space. Spring operated material handling equipment has huge load carrying capacity, large covering area simplified design, easy maintenance, and high reliability of operation. This paper is mainly based on for material handling is not required external power i.e. electrical. According to industrial review the power which has been utilized for production out of which 32 to 35% of power is only utilized for material handling during the production which is unnecessarily wasted and hence the total cost of final product will increase.

III. AIM AND OBJECTIVES

The aim of this project is to minimize human effort by using weight operated material handling equipment for transferring material from one place to other without any power source like electricity.

The main objective of material handling equipment is to minimize the damages during manual transmission of material and transfer material to desired place. It is used to improve working condition viz. providing safety, reducing fatigue and job effort, etc. In this project, we focus on transition of material without electricity for more conservation of energy, because today the energy sources are fast depleting with time.

IV. WORK DISCUSSION

Material handling is main operation in industry. Material handling involves transfer of jobs from one machine station to another storage and packaging. Weight operated material handling device has large load carrying capacity, less or no maintenance. This device has more reliability. This paper develops the problem of different types of material handling equipment in a typical material handling system. Spring operated material handling equipment has large load carrying capacity, easy maintenance, and high reliability of operation. Material handling equipment is the media of transportation of material from one point to another in a commercial point or space. This material handling equipment paper is not only based on for material handling, it is not required external power i.e., electrical, it totally operate and depends on weight of material or job. Industrial material handling device are operating on electrical power, but this device does not required electricity, it is operate on weight of job. This paper is based on two mechanical mechanisms which are rack and pinion and chain and sprocket arrangement. This material handling device eliminates the manual material for short distance between two machine stations. These material handling devices also reduce the pries of the product by minimizing material handling cost. These also reduce the cost of power. In this device potential energy of the job is used to transfer of the job.

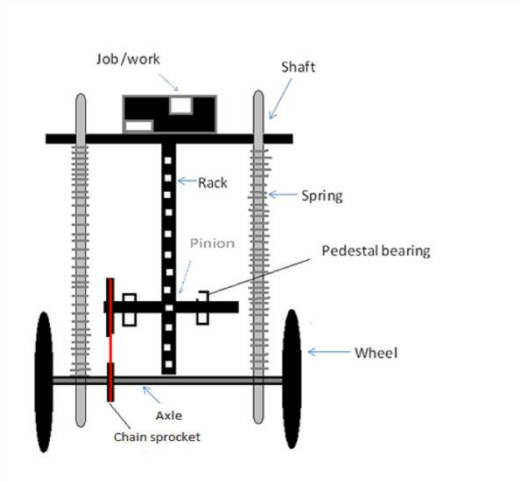

Figure 1

V. CONSTUCTION AND WORKING

In its simple construction 90cm height supports frame structure is carried out four wheels. To these structure three horizontal rigid shafts and two vertical shafts attached. Horizontal Shaft diameter is 20cm and vertical shaft diameter is 20cm.frame length structure length is 60cm, width42cm. Six bearings are used in this project. Two attached to top of the structure and four are attached at bottom portion of the project. Two coil springs are used in vertical shaft its wire diameter 2cm and coil diameter 20cm. chain sprocket inner and outer diameter is 18cm and 6cm respectively. Rack and pinion vertical engaged and disengaged. Top shaft attached maximum diameter sprocket and bottom shaft attached minimum diameter sprocket for maximum efficiency purpose. Chain engaged both the shaft. When load increase then firstly top shaft rotates then bottom rotate. When we keep 35kg or more weight of job or work piece on top plate then, plate will go to downward side. At that time rack and pinion engages gradually then simultaneously pinion engaged to the pedestal bearing shaft. These pedestals bearing maintained balance between rack, pinion and shaft. So, at that time spring will be compressed. With the help of rack and pinion pulley also rotate clockwise then simultaneously chain also rotate and chain engaged to the main axle or shaft. It will be rotate then obviously wheel also

rotate. Then vehicle travel near about 10feet distance. After vehicle travels some distance and the job or work piece is removed from top most plate then spring forces moves to upward and release its compresses. Spring regains its original condition at that time chain sprocket rotate anticlockwise and pulley also rotate means rack and pinion gradually rotate. And vehicle moves backward side means after removing weight vehicle goes to its original Position.

DESIGN OF GEAR

As in our project when near about 20 kg weight is placed then the input rotation of pinion gear is 1 rotation. This rotation is transmitted to big sprocket having 27 teeth. The big sprocket is again connected with small sprocket having 18 teeth. Now we calculate number of rotation of small gear

As we know,

$$\frac{\text{Big gear rotation}}{\text{small gear}} \quad N$$

$$\frac{\text{Small gear rotation}}{\text{N big gear}}$$

$1 \div x = 27 \div 18$

$x = (27*1)/18$

$x = 1.5$

Small gear rotation = 1.5 rotation

The same rotation of small sprocket is transmitted to big gear as it is mounted on same shaft. But we selected rack and pinion at one moment near 3 revolutions at first shaft, so we get the final rpm is 147rpm.

DESIGN OF SHAFT

Calculation of torque induced on the shaft:

Manual load applied by is 139 kg.

Radius of pinion is 30mm.

So

Torque transmitted

T = F x L x FOS

T = 139 x 9.81 x 30x 1.5

T = 6135.92N-mm

DESIGN OF CHAIN

We know that torque is 6135.92 N-mm

RPM is 147 rpm

Therefore, we can calculate power as

$P= (2\pi*N*T)/60$

P=944.5W

For 200 rpm and 1180 W, 08B simple roller chain is selected.

Characteristics of 08B roller chain according to IS:2403-1991

Pitch:12.7mm

Roller dia.:8.5mm

Transverse pitch:13.9mm

Breaking load: 17.8KN

6.3 DESIGN OF CHAIN SPROCKET

Pitch: 12.7mm

Pitch circle dia.: P*cosec (180/T)

For T=26 D=105mm

For T=16 D=65mm

DESIGN OF BEARING

Selecting bearing number 202

Inner dia: 15 mm

Outer dia: 35 mm

Width: 11 mm

DESIGN OF PINION

Selecting the module of pinion gear from design data hand book m = 2.5 mm

For m = 2.5 mm we take following data from design data hand book

Pressure angle (Φ) = 20^0

Addendum(m) = 2.5 mm

Dedendum = 1.25 m = 3.125 mm

Working depth = 2*2.5 = 5 mm

Min depth = 2.25*2.5 = 5.625 mm

Thickness of tooth = 1.5708*2.5 = 3.927 mm

Fillet radius = 0.4 m =1 mm

Min no of teeth of pinion for intermittent service & in hand operated operation is 28 as per requirement.

Selecting no of teeth on pinion gear Np = 28teeth

Allowable stress for pinion made of semi steel = 126 N / mm²

Checking beam strength of pinion using

VI. CONCLUSION

The project then worked out displays results as expected. Material handling operations involve raw material movements, work-in process, subassemblies, finished products, tools, and other support materials from one point to another in the plant These include capturing all relevant data related to the warehouse 's operation measuring how many times an item is touched from the time it is ordered until it leaves the building, making sure you are using the proper picking technology, and keeping system downtime to a minimum. Material can handle by job weight then there is no required extra energy for transport or travelling purpose.

VII. ADVANTAGES AND DISADVANTAGES

ADVANTAGES

- Unobstructed movement
- Flexibility
- No anyone power required
- Greater reliability
- Less environmental problems.
- Lower investment
- Higher operating savings on long run
- Minimal labor cost
- Easy maintenance
- Easy to interface with other systems

DISADVANTAGES

- Working efficiency is less, because of mechanical components compared to hydraulic system.
- Wear of gear is possible

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